NON-PUBLIC?: N
ACCESSION #: 9307060241
LICENSEE EVENT REPORT (LER)

FACILITY NAME: Grand Gulf Nuclear Station PAGE: 1 OF 6

DOCKET NUMBER: 05000416

TITLE: Update to Reactor Scram Due To Lightning Strike
EVENT DATE: 06/06/92 LER #: 90-010-01 REPORT DATE: 06/30/93

OTHER FACILITIES INVOLVED: N/A DOCKET NO: 05000

OPERATING MODE: 2 POWER LEVEL: 005

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR SECTION:
50.73(a)(2)(iv)

LICENSEE CONTACT FOR THIS LER:
NAME: Riley Ruffin / Licensing Specialist TELEPHONE: (601) 437-2167

COMPONENT FAILURE DESCRIPTION:
CAUSE: SYSTEM: COMPONENT: MANUFACTURER:
REPORTABLE NPRDS:

SUPPLEMENTAL REPORT EXPECTED: NO

ABSTRACT:

On June 6, 1992 at approximately 1836 hours station licensed operators were increasing reactor thermal power following the fifth refueling outage. During the power ascension, the reactor scrammed due to an RPS actuation signal from the Average Power Range Monitoring System (APRM). In STARTUP the high neutron flux trip occurs at approximately 15 percent thermal power. Following the scram, vessel level decreased to approximately 14 inches. Level was restored by the Feedwater system and the plant was stabilized in accordance with plant procedures. Generation of a scram signal is believed to have been caused by electromagnetic interference (EMI) coupling into the APRM system. The EMI was the result of an electrical storm in the vicinity of the plant. GGNS is currently monitoring and evaluating data experienced during lightning activity. The results of the evaluation will be used to develop additional corrective actions, if warranted. No safety functions or components were compromised as a result of this event. Therefore the occurrence did not adversely impact the health and safety of the public.

END OF ABSTRACT

A. Reportable Occurrence

On June 6, 1992 at approximately 1836 hours, an automatic Reactor Protection System (RPS) JC! actuation occurred due to a lightning induced neutron monitoring spike. This event is being reported pursuant to 10 CFR 50.73(a)(2)(iv).

B. Initial Conditions

The plant was in Operational Condition 2 with reactor water at approximately 538 degrees F. The plant was in startup from the fifth refueling outage. Reactor power was approximately 5 percent. An electrical storm was in the plant vicinity.

C. Description of Occurrence

On June 6, 1992 at approximately 1836 hours station licensed operators were increasing reactor thermal power following the fifth refueling outage (RFO5). During the power ascension, the reactor scrammed due to an RPS actuation signal from the Average Power Range Monitoring (APRM) System IG!. In Mode 2 (STARTUP) the high neutron flux trip occurs at approximately 15 percent thermal power, Based on a review of the data, it was determined that a short duration spike occurred on the APRMs that resulted in trips on channels C, D, G, and H. However, evidence did not indicate a high flux condition at the time of the scram.

High Pressure Core Spray (HPCS) BG! low water level channels (R and C) also received a trip signal during the storm. However, HPCS did not actuate due to the short duration of the signal. This symptom has been observed during other lightning induced transients at GGNS.

Following the scram, vessel level decreased to approximately 14 inches as indicated by General Electric Transient Recorder System (GETARS). Level was restored by the Feedwater system SJ! and the plant was stabilized in accordance with plant procedures.

D. Apparent Cause

Generation of a scram signal is believed to have been caused by electromagnetic interference (EMI) coupling into the APRM system. The EMI was the result of an electrical storm in the vicinity of the plant.

As reported in LER 91-012, a task force is actively evaluating methods to reduce the susceptibility of GGNS to lightning induced transients.

The Local Power Range Monitoring (LPRM) System IG! signal cable shields are referenced to ground both at the control room and at the vessel per original design. Noise voltages have been recorded across these signal cable shields during lightning storms. This voltage is impressed across the LPRM signal cable shields from either a station ground grid transient and/or induced as a result of the loops formed by these shields. Testing has identified a path for noise currents on the LPRM shields to couple into the LPRM circuit and cause an inadvertent APRM upscale neutron trip. Corrective actions have been taken to eliminate this coupling path identified through testing. In addition, the LPRM signal cables are broken out of their coaxial configuration at the containment penetrations and are routed through the penetrations on single insulated conductors. The noise currents on the LPRM shields may be self-inducing a voltage between the LPRM signal conductor and its shield which may couple into the LPRM circuit and cause an inadvertent APRM upscale neutron trip.

E. Corrective Action

A task force was assembled following the Scram, which occurred November 19, 1991, consisting of Plant Engineering, General Electric (GE) Consultant Engineers and a Noise Reduction Consultant Engineer. This task force provided the following recommendations that have been implemented or are in the process of being implemented.

1. Issued standing order to reduce power during lightning storms to reduce the potential for invalid safety system actuation during lightning storms.

2. A weather monitoring system was installed to give control room personnel the ability to track storm fronts as they come in close proximity to the plant, enabling operations personnel to decrease and increase reactor power in a more timely and efficient manner.

3. Several ventilation radiation monitors that provide input to instrumentation within the neutron monitoring control panels were found not insulated from their respective ducts. This could be a potential path for noise to enter the neutron monitoring panels an therefore these monitors were insulated from the duct.

4. Ferrite Beads were installed on the Local Power Range Monitoring (LPRM) IG! cables to suppress high-frequency common mode noise on LPRM signal cables.

5. Magnetic shielding foil was installed around the splices of the LPRM signal cables (coaxial cable) to the containment penetration feedthrough conductors on both the inboard and outboard side of the penetrations. This magnetic foil should reduce magnetic coupling of noise in the LPRM signal cables at the containment penetrations.

6. A short time delay was installed on the power supply monitoring card to allow s all noise transients that may filter through the APRM power supply time to dissipate before tripping the power supply.

7. The panel chassis ground busses within each of the neutron monitoring control pa were strapped to the instrument ground bus (IGB). This should provide an environment which exhibits less noise in the neutron monitoring instrumentation within these control panels.

8. The neutrals of the Class 1E inverters that provide power to the neutron monitoring system were tied to the IGB. Existing GE specifications recommended the neutral of the neutron monitoring system power source be tied to the IGB.

9. The filter choke design which was addressed in LER 92-010-00 has been cancelled. These filter chokes introduced undesirable perturbations within the DC power supply circuit in which they were installed.

10. Testing identified a path within the LPRM circuit for noise currents on the LPRM signal cable shields to couple into the APRM circuit. This testing also confirmed that this noise current will cause the ARPM system to respond with an inadvertent upscale neutron trip. Noise currents have been recorded on the LPRM signal cable shields during lightning

storms. A modification has been implemented to eliminate this coupling path within the LPRM circuit.

11. Additional ferrite beads will be installed on the LPRM sig
al
cables at the containment penetrations. These beads are designed to suppress high frequency common mode noise currents which are suspect for inducing voltages into the LPRM signal cables at the penetrations.

12. Testing is being performed to determine if a source of noise intrusion into the APRM circuit is voltage induced into the LPRM signal cables at the containment penetrations. If this noise intrusion path is confirmed, the LPRM signal cable containment penetrations may be replaced with coaxial feed-through penetrations.

13. The panel chassis ground busses within the control room panels that contain trip units will be strapped to the IG B. This will prevent noise voltages from developing between these two busses (chassis ground & instrument ground) which has been identified through testing to cause the trip units to inadvertently trip or gross fail.

In a continuing effort to eliminate lightning induced transients, further studies are in progress to reduce the susceptibility of GGNS to the effects of lightning.

F. Safety Assessment

Based on a review of data, it was determined that all safety systems behaved as expected. Vessel water level decreased to a minimum of 14 inches, as indicated by GETARS, which was approximately 180 inches above the top of active fuel. No safety functions or components were compromised as a result of the event.

G. Additional Information

Subsequent to commercial operations, GGNS has experienced six scrams due to lightning strikes. The previous events were reported in LERs 88-012, 89-010, 89-016, 91-010, and 91-012.

On March 30, 1993, a lightning storm was in progress in the vicinity of the plant. Due to administrative controls which require a power

reduction during lighting storms, the plant was operating at approximately 80 percent thermal power.

During the lightning storm, Control Rod Drive AA! Scram Discharge Volume level transmitter C11-N012D failed upscale causing a 1/2 Scram. This failure is attributed to the lightning activity. The failed component has been returned to the vendor for identification of the failed component within the transmitter and the cause of failure.

Lightning Eliminators and Consultants Inc. (LEC) performed a site inspection following the March 30th half Scram event. LEC will provide recommendations to strengthen the zone of protection for the site area.

There were several trip units that inadvertently gross failed. However, trip units located in control panels adjacent to the APRM panels, that had a history of inadvertently gross failing during the first five lightning induced APRM Scrams, did not gross fail during the last two lightning related events (i.e., June 6, 1992 and March 30, 1993). This is attributed to the installation of ground straps within the APRM panels that was performed during RFO5.

Energy Industry Identification System (EIIS) codes are identified in the text within brackets !.

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June 30, 1993 C. R. Hutchinson
Vice President
Operations
Grand Gulf Nuclear Station

U.S. Nuclear Regulatory Commission
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Attention: Document Control Desk

SUBJECT: Grand Gulf Nuclear Station
Unit 1
Docket No. 50-416
License No. NPF-29
Update to Reactor Scram Due To Lightning Strike
LER 92-010-01

GNRO-93/00079

Gentlemen:

Attached is Licensee Event Report (LER) 92-010-01 which is a final report.

Yours truly,

CRH/RR/
attachment
cc: Mr. R. H. Bernhard (w/a)
Mr. H. W. Keiser (w/a)
Mr. R. B. McGehee (w/a)
Mr. N. S. Reynolds (w/a)
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